



*Aquatic Enhancement  
& Survey, Inc.*

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**2007  
Aquatic Plant Management Plan Update for  
Wall Lake  
LaGrange County, Indiana**

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Prepared for the  
Wall Lake Fisherman's Association  
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## **Executive Summary**

Wall Lake is a 141 acre Indiana oligotrophic (ITSI rated) kettle lake in LaGrange County Indiana. It has a relatively small watershed of 753 acres comprised largely of wooded, developed and agricultural lands. Wall Lake has a relatively diverse aquatic flora with at least 20 separate species of submersed aquatic plants being identified in various surveys (See table 1 below). This includes 18 native species, and one possible endangered species. Fifteen years ago Wall Lake's flora was largely native, relatively stable, and user friendly. Only the lake's three excavated channels had aquatic plants in enough quantity to provide a major hindrance to recreational activities such as boating and fishing. The aquatic plant understory was dominated by Chara while native pondweeds grew in tall stands in many deeper areas. In the mid 1990's Eurasian watermilfoil *Myriophyllum spicatum*, an exotic invasive species began to become more prominent in Wall Lake. From 1998 to 2003 the amount of Eurasian watermilfoil and the density of its growth increased despite effective lakewide treatments with both contact and systemic herbicides. In 2005 LARE cost share funding was utilized by the Wall Lake Fisherman's Association to develop an aquatic plant management plan for the lake. The plan contains the following primary goals:

**Goal 1. • Maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality and is resistant to minor habitat disturbances and invasive species.**

**Goal 2. • Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species.**

**Goal 3. • Provide reasonable public recreational access while minimizing the negative impacts on plant, fish, and wildlife resources.**

Under the 2005 plan another cost-share grant was obtained to perform a six part-per-billion fluridone treatment on Eurasian milfoil. The treatment was performed in May of 2005 and control of Wall Lake's Eurasian watermilfoil problem was complete by the end of that season. Wall Lake's plant community appears to have responded well to its 2005 whole lake treatment but is undergoing a slow regression back toward milfoil colonization. In 2006 five acres of returning Eurasian watermilfoil was treated to prevent a quick return to problem growth levels. In response to a growing prominence of the early season exotic plant Curlyleaf pondweed *Potamogeton crispus*, approximately 10 acres was treated with Aquathol K liquid aquatic contact herbicide. The goal of this treatment was to kill the Curlyleaf pondweed early in the season before turion (seed) production took place and thus reduce the amount of the next season's growth. This is typically done in April, but the timing of the emergence of the plants occurred later in the season, pushing the Curlyleaf treatment into May. This treatment took place on May 18<sup>th</sup>, 2007. On June 25<sup>th</sup> approximately 10 acres of Eurasian watermilfoil growth was treated with 2,4-D granular aquatic herbicide. The results of both treatments were good, but the growth of non-target beneficial pondweeds in Wall Lake declined, presumably in response to the Curlyleaf pondweed treatment. The growth of late season plants unaffected by the May treatment such as Vallisneria *Vallisneria americana* and Slender naiad *Najas flexilis* increased. The amount of milfoil that will be present in 2008 is difficult to determine, but an increase to 15 acres from the 2007 season's ten acre treatment is probably a realistic estimate.

It is recommended that the Wall Lake residents plan to treat 15 acres of Eurasian watermilfoil with granular 2,4-D aquatic herbicide in the 2008 season. It is also recommended that 10 acres of Curlyleaf pondweed also be chemically treated in 2007. This should be done with an ultra-early contact herbicide application Aquathol K liquid, (as was planned in 2006) to prevent reproduction of these plants via early season turion formation. If the Curlyleaf pondweed is allowed to grow unchecked the development of a significant secondary problem may occur. To help the lake's pondweeds recover the Curlyleaf treatment should be performed prior to May 1<sup>st</sup> (before most native pondweeds emerge) at a reduced application rate of one half part-per-million Aquathol K liquid. If the Curlyleaf has not emerged sufficiently for treatment by May 1<sup>st</sup> the Curlyleaf treatment should be cancelled. The expected cost of the treatment of 15 acres of Eurasian watermilfoil is 6240.00. The expected cost of the ultra-early Curlyleaf pondweed treatment is 3300.00. The estimated cost of planning and plant surveys is 4150.00. Whereas purple loosestrife *Lythrum salicaria* an invasive non-native wetland plant has begun to colonize Wall Lake's shoreline, a program of treatment for this plant should be implemented to protect area wetland plant communities. The cost of this treatment is estimated to be 500.00. The total 2008 program cost is 14,190.00. Prospects appear to be excellent for continued management of Wall Lake's plant community to provide for good wildlife habitat, good plant species diversity, recreational use, and the maintenance of habitat for the recent Walleye stocking program at the lake. Following up on the recommendations from Wall Lake's recent Lake Diagnostic Study will also be important in protecting the lake's water quality and aquatic plant community.

Common Name(s)	Scientific Name	Species Code	Nativity Native/Introduced	Indiana Status (Rare/Threatened/Endangered)
Variable pondweed	<i>Potamogeton gramineus</i>	POGR	N	
Chara, Muskgrass, Stonewort	<i>Chara</i> sp.	CH?AR	N	
Nitella (2003 IDNR survey)	<i>Nitella</i> sp.	NI?TE	N	
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	POZO	N	
<b>Eurasian watermilfoil</b>	<b><i>Myriophyllum spicatum</i></b>	<b>*MYSP2</b>	<b>I</b>	
Northern watermilfoil, Shortspike watermilfoil, Common watermilfoil (2003 IDNR Survey)	<i>Myriophyllum sibiricum</i>	MYSI	N	
Illinois pondweed	<i>Potamogeton illinoensis</i>	POIL	N	
<b>Curlyleaf pondweed</b>	<b><i>Potamogeton crispus</i></b>	<b>POCR3</b>	<b>I</b>	
Sago pondweed	<i>Potamogeton pectinatus</i>	POPE6	N	
Elodea, Common waterweed	<i>Elodea canadensis</i>	ELCA	N	
Heartleaf pondweed	<i>Potamogeton pulcher</i>		N	E
Largeleaf pondweed	<i>Potamogeton amplifolius</i>	POAM	N	
Vallisneria, Tapegrass, Eelgrass, Wild celery	<i>Vallisneria americana</i>	VAAM	N	
Small pondweed	<i>Potamogeton pusillus</i>	POPU	N	
Coontail	<i>Ceratophyllum demersum</i>	CEDE	N	
Great bladderwort, Common bladderwort	<i>Utricularia vulgaris</i>	UTMA	N	
Creeping Bladderwort	<i>Utricularia gibba</i> L.	UTGI	N	
Water stargrass	<i>Zosterella dubia</i> , <i>Heteranthera dubia</i>	ZODU/HE DU	N	
Filamentous algae	Any species	ALGA	N	
Common naiad, Slender naiad	<i>Najas flexilis</i>	NAFL	N	
Spiny naiad	<i>Najas marina</i>	NAMA	N	

**Table 1 Species Reported from Wall Lake in Various Surveys**

## **1.0 Introduction**

There have been no significant changes in the current year.

See: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* (Aquatic Enhancement & Survey, Inc. 2005 and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana 2006*)

## **2.0 Watershed and Lake Characteristics**

There have been no significant changes in the current year.

See: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* (Aquatic Enhancement & Survey, Inc. 2005 and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana 2006*)

## **3.0 Lake Uses**

There have been no significant changes in the current year.

See: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* (Aquatic Enhancement & Survey, Inc. 2005 and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana 2006*)

## **4.0 Fisheries**

There have been no significant changes in the current year.

See: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* (Aquatic Enhancement & Survey, Inc. 2005 and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana 2006*)

## **5.0 Problem Statement**

There have been no significant changes in the current year.

See: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* (Aquatic Enhancement & Survey, Inc. 2005 and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana 2006*)

## **6.0 Vegetation Management Goals and Objectives**

The 2005 Wall Lake Plant management plan established the following goals:

1. Restoring and maintaining a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality and is resistant to minor habitat disturbances and invasive species.
2. Directing efforts to preventing and/or controlling the negative impacts of aquatic invasive species.
3. Providing reasonable public recreational access to Wall Lake while minimizing the negative impacts on plant, fish and wildlife resources.

Season 2008 benchmarks for plant management success in working toward the original plan goals have been established in this update as a late season Tier II occurrence of five percent or less



for both Curlyleaf pondweed and Eurasian watermilfoil, coupled with an increase in the occurrence of the majority of native pondweed species.

#### **7.0 Plant Management History, 2007 Season Management Actions**

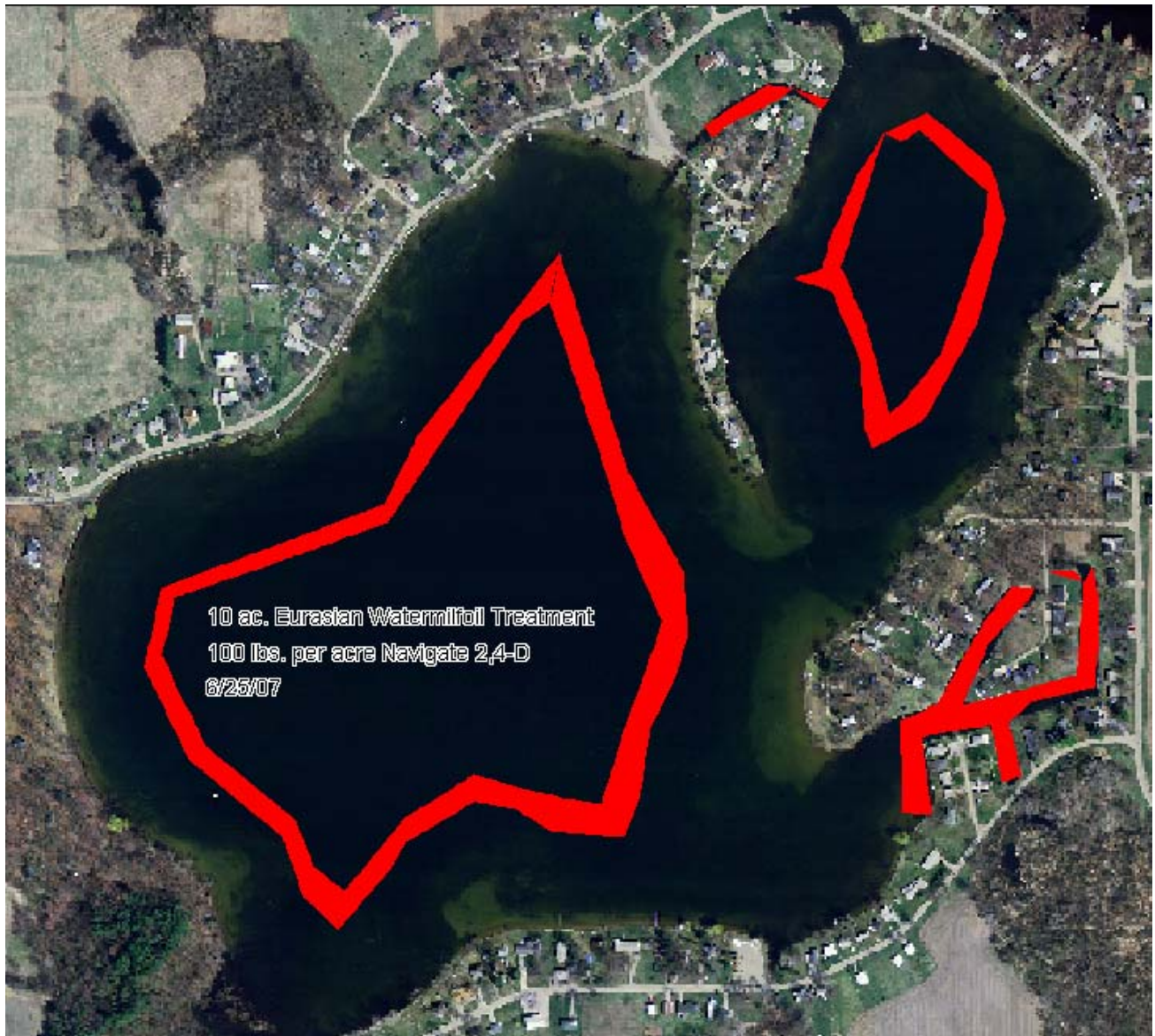
With the intention of performing an early-season treatment on Curlyleaf pondweed using Aquathol K, followed by a later Eurasian milfoil treatment with granular 2,4-D the lake was checked for Curlyleaf growth in April. Little Curlyleaf pondweed was present. By Mid-May enough Curlyleaf had finally emerged to warrant treatment. Maps were made for each of the two exotic species and on May 18 ten acres of Curlyleaf were treated with 1 ppm Aquathol K liquid herbicide at a surface water temp. of 67.3 degrees F. The treatment roughly covered a weedline-ring around each of the lake's two basins. Figure 1 below represents both the Curlyleaf pondweed distribution and May 18 treatment maps. Treatment results were excellent. Residents noted that Curlyleaf pondweed plants were killed a considerable distance away from the treatment areas. Eurasian watermilfoil was also damaged in the Curlyleaf treatment. On June 25 Eurasian watermilfoil appeared to have recovered somewhat from the Curlyleaf treatment so a milfoil treatment was performed on all acreage seen to contain live milfoil plants. Ten acres were treated. Figure 2 below represents both the Eurasian watermilfoil distribution map and treatment map. The treatment was highly effective with no regrowth noted in the 2007 season. On July 26<sup>th</sup> a Tier II aquatic plant survey was performed to assess changes in the lake's plant community. In October an additional visit was made to the lake to observe excessive filamentous algae growth reported earlier by residents in the southeast bay of Wall Lake. Much of the algae had dissipated by that time. The complete plant management history for Wall Lake is summarized below.

<b>Year</b>	<b>Approximate Acres of Milfoil</b>	<b>Management Activity</b>
1996	7	Basic Plant Mapping performed
1997	10	Basic Plant Mapping repeated
1998	14	Channel treatments for native and exotic plant control 14 acres of open-lake milfoil treatment (2,4-D)
1999	20	Channel treatments for native and exotic plant control
2000	22	Channel treatments for native and exotic plant control App. 22 acres of open-lake milfoil treatment (2,4-D)
2001	22	Channel treatments for native and exotic plant control App. 22 acres of open-lake milfoil treatment (Reward)
2002	22	Mechanical Harvesting
2003	25	Channel treatments for native and exotic plant control Approx. 25 acres of open-lake milfoil treatment (Reward) INDR random sampling begins Association applies for LARE funding
2004	25	Channel treatments for native and exotic plant control Approx. 25 acres of open-lake milfoil treatment (Reward) Wall Lake APMP developed
2005	0 (end of season)	Channel treatments for native and exotic plant control LARE cost-share funded 6 bump 6 fluridone treatment and plant plan updated
2006	5	5 acres of returning milfoil treated (2,4-D) (LARE cost-share) Wall Lake Diagnostic Study Compiled. plant plan updated
2007	10	Treatment of Curlyleaf Pondweed in both lake basins (Aquathol K)
2007	10	Treatment of returning milfoil (2,4-D) and plant plan updated

**Table 2 Summary of Past Plant Management Activities at Wall Lake**



**Figure 1** Curlyleaf pondweed distribution and Treatment Area 5/18/07, The ring growth pattern for exotic plants in Wall Lake is likely the result of a combination of fertile sediment and sufficient light in roughly the 6-12 foot depth contour. In many shallower areas of Wall Lake wind and wave action prevent the settling of fertile silts, leaving sand and gravel hydrosols. Deeper areas lack sufficient light to support plant growth.



**Figure 2 Eurasian watermilfoil distribution and Treatment Area 6/25/07**



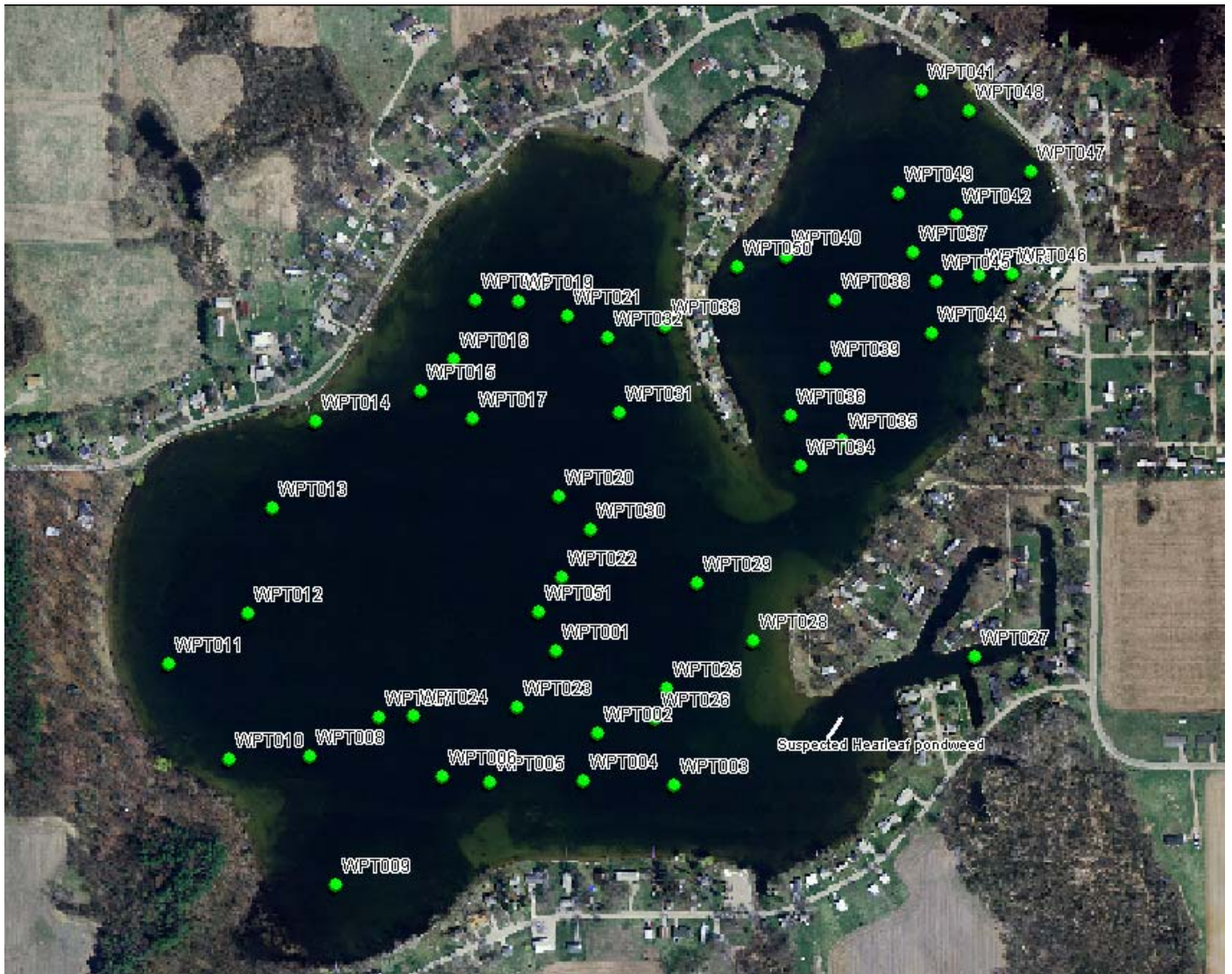
## **8.0 Aquatic Plant Community Characterization**

### **8.1 Methods**

Two primary methods of observation were used to characterize the lake's plant community during the 2007 season. Exotic plant beds were mapped in 2007 mainly by visual observation. Extensive time was spent running a zigzag pattern over the lake's littoral zone to establish the boundaries for dense exotic plant growth. This replaced the Tier I survey protocol used in 2006. This was complimented by Tier II quantitative survey plant collection data and observation, prior knowledge of the lake's typical plant growth pattern, and a contour map. A handheld WAAS Enabled GPS unit was also helpful in marking the general boundaries of exotic plantbeds for mapping. The Tier II protocol used was similar to 2006 with slight changes. (See: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana 2006* for Tier II protocol discussion) In 2006 plant mass was measured as a rake score of one through five. In 2007 a score of one, three, or five was used.

#### **8.1.1 Tier II**

Tier II stratified random sampling was utilized on July 26, 2007 to establish random plant sampling points and quantify approximate species biomass at each respective point. The 50 sampling points used are displayed in figure 3 below. Based on the Tier II procedure as previously specified by IDNR the sampling points were chosen randomly and did not repeat collections from sampling points designated in prior seasons. Repeated sampling are not specified in the current Tier II protocol (May 2007), however IDNR review comments and personal communications since the fall of 2007 indicate that the most current method should incorporate collections from the same sampling points from season to season. Sampling in 2008 should be performed at the same set of sites utilized in 2007. The most current Tier II aquatic plant sampling protocol is available in full in *Tier II Aquatic Vegetation Survey Protocol, May 2007* (IDNR 2007).



**Figure 3 7/26/07 Tier II Sampling Points for Wall Lake**

## 8.2 Results

### 8.2.1 Tier II

#### Macrophyte Inventory Discussion

Table four below displays the Overall Tier II survey data for 2007. *Chara Chara sp.* was the most common plant collected occurring at 49 percent of sampling sites. *Vallisneria* ranked number two occurring at 17.6 percent of sampling sites. Variable pondweed *Potamogeton gramineus* ranked third being sampled at 9.8 percent of sampling sites. Eurasian watermilfoil was not noted in the survey and Curlyleaf pondweed was only collected at one sampling site. The plant community in 2007 was solidly dominated by native species. Based on the 2007 survey results a goal of five percent or less occurrence of both Curlyleaf pondweed and Eurasian watermilfoil is realistic for 2008.

Table three contains basic Tier II descriptor data from surveys performed since 2004, with data from a set of 21 other Indiana Lakes provided for comparison (Pearson 2004). In 2007 Wall Lake had 10 submersed species and nine submersed native species. Wall Lake remains above the 21 lake average in terms of all the descriptors except for mean number of species per site. The number of species noted has declined from 14 species in 2004 and has been at 10 species for the past three years. Similar declines have occurred in native species observed, species diversity index and frequency of occurrence. Some of this trend may be due to a change in protocol begun in 2006. To comply with the depth-strata specific requirement in the new protocol, more rake tosses are performed in deep water, where plants are not present on Wall Lake. Plants occurred to a maximum depth of 18 feet while sampling was performed to 25 feet. In the future a maximum sampling depth of 20 feet may fit the lakes littoral area better; however changing the sampling protocol again will extend problems with year to year comparisons into another season. Maintaining a consistent year to year sampling protocol may be more beneficial. It is also possible that part of the decline is attributable to the whole lake treatment in 2005. In a mesotrophic Minnesota lake it has been shown that the average number of taxa per sampling site can decline in the season of a low-dose fluridone treatment followed by an increase in the average number of taxa per site in the first and second year following treatment (Crowell et al 2006). In 2007 it appears that a change occurred in response to the Curlyleaf pondweed treatment performed on May 18. Other pondweeds besides Curlyleaf can be susceptible to the Aquathol K liquid herbicide used. The changes in pondweed specific results from 2006 to 2007 seem to support this (table 5 below). Declines in frequency of occurrence were noted in every native pondweed species collected, while late season plants that would not have been exposed to the treatment (*Vallisneria* and *Slender naiad*) enjoyed a slight increase, presumably in response to lesser competition from the pondweeds. Slight increases in the occurrences of most of the native pondweed species should be a goal of the 2008 season's plant management. Scattered localized algae blooms noted to be worse in 2007 than most other seasons also probably suppressed the occurrence of some plants and *Chara* by diminishing light penetration. Continuing to address nutrient sources in the watershed as recommended in the Wall Lake Diagnostic Study will be important in minimizing the presence of the algae blooms in the future. Early in 2007 a plant identified in the field as Heartleaf pondweed (also called spotted pondweed) *Potamogeton pulcher* was found in Wall Lake near the entrance to the southeast channel system (figure 3 above). This plant has the status of "endangered" in Indiana. It is a large pondweed resembling Illinois pondweed *Potamogeton illinoensis*. It typically has submersed leaves 7-15 Centimeters long and 103 centimeters long with wavy margins. Its leaves contain 10-20 veins. As part of the 2007 work one of these plants was to be collected, positively identified, and preserved as a voucher specimen. An attempt at collection was made late in the 2007 season but a large amount of filamentous algae present in the area of these plants appeared to have suppressed pondweed growth in the 2007 season and a specimen could not be located. A voucher specimen should be collected in 2008 if this plant can again be located. No plant voucher specimens were collected from Wall Lake in 2007.

<b>Descriptor</b>	<b>Post-Treatment (Reward) 8/30/04</b>	<b>Pre-treatment 5/23/05</b>	<b>Post-Treatment (Sonar) 8/29/05</b>	<b>Post-Treatment (5 acres 2,4-D) *New Protocol 8/29/06</b>	<b>Post-Treatment (10 acres Aquathol K, 10 acres 2,4-D) *New Protocol 7/26/07</b>	<b>range for 21 other Indiana lakes</b>	<b>mean for 21 other Indiana lakes</b>
# Sampling sites	60	64	61	50	51		
Total number of species	14	11	10	10	10	1 to 17	8
Total number of native species	11	10	9	8	9	1 to 16	7
Mean number of species per site	2.82	1.64	2.11	1.42	1.10	.38 to 2.66	1.61
Species diversity index (SDI), 0-1 scale,	.86	0.79	0.80	.82	.75	0.0 to .91	0.66
Aquatic Vegetation % Frequency of Occurrence	100	100	100	68	63	n/d	n/d
Mean rake density	4.1	3.125	3.44	n/d	n/d	1.8 to 4.7	3.3

**Table 3 Plant Community History for Wall Lake 2004 to Present**

<b>Occurrence and Abundance of Submersed Aquatic Plants - Overall</b>								
Lake: Wall			Secchi(ft): 13.4			SE Mean species / site: 0.16		
Date: 7/26/2007			Littoral sites with plants: 32			Mean natives / site: 1.08		
Littoral Depth (ft): 18.0			Number of species: 10			SE Mean natives / site: 0.16		
Littoral Sites: 40			Maximum species / site: 4			Species diversity: 0.75		
Total Sites: 51			Mean species / site: 1.10			Native diversity: 0.74		
		<b>Frequency of</b>		<b>Score Frequency</b>				
<b>Species</b>		<b>Occurrence</b>		<b>0</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>Dominance</b>
CHAR Chara		49.0		51.0	19.6	5.9	23.5	31.0
VALAME Vallisneria		17.6		82.4	11.8	5.9	0.0	5.9
POTGRA Variable pondweed		9.8		90.2	9.8	0.0	0.0	2.0
STUPEC Sago pondweed		9.8		90.2	9.8	0.0	0.0	2.0
POTZOS Flatstem pondweed		7.8		92.2	7.8	0.0	0.0	1.6
NAJFLE Slender naiad		5.9		94.1	5.9	0.0	0.0	1.2
POTILL Illinois pondweed		3.9		96.1	3.9	0.0	0.0	0.8
UTRMAC Great bladderwort		2.0		98.0	0.0	2.0	0.0	1.2
POTAMP Largeleaf pondweed		2.0		98.0	2.0	0.0	0.0	0.4
POTCRI Curlyleaf		2.0		98.0	2.0	0.0	0.0	0.4

**Table 4 7/26/07 Overall Plant Community Descriptors for Wall Lake**



Occurrence and Abundance of Submersed Aquatic Plants - 0 to 5 ft.								
Lake: Wall			Secchi(ft): 13.4		SE Mean species / site: 0.21			
Date: 7/26/2007			Littoral sites with plants: 10		Mean natives / site: 1.70			
Littoral Depth (ft): 18.0			Number of species: 5		SE Mean natives / site: 0.21			
Littoral Sites: 10			Maximum species / site: 3		Species diversity: 0.60			
Total Sites: 10			Mean species / site: 1.70		Native diversity: 0.60			
		Frequency of		Score Frequency				
Species		Occurrence		0	1	3	5	Dominance
CHAR Chara		100.0		0.0	10.0	30.0	60.0	80.0
POTGRA Variable pondweed		30.0		70.0	30.0	0.0	0.0	6.0
VALAME Vallisneria		20.0		80.0	20.0	0.0	0.0	4.0
NAJFLE Slender naiad		10.0		90.0	10.0	0.0	0.0	2.0
STUPEC Sago pondweed		10.0		90.0	10.0	0.0	0.0	2.0

Figure 4 0-5 Foot Contour Plant Community Descriptors for Wall Lake

Occurrence and Abundance of Submersed Aquatic Plants - 5 to 10 ft.								
Lake: Wall			Secchi(ft): 13.4		SE Mean species / site: 0.31			
Date: 7/26/2007			Littoral sites with plants: 11		Mean natives / site: 2.45			
Littoral Depth (ft): 18.0			Number of species: 9		SE Mean natives / site: 0.31			
Littoral Sites: 11			Maximum species / site: 4		Species diversity: 0.82			
Total Sites: 11			Mean species / site: 2.45		Native diversity: 0.82			
		Frequency of		Score Frequency				
Species		Occurrence		0	1	3	5	Dominance
CHAR Chara		72.7		27.3	27.3	0.0	45.5	50.9
VALAME Vallisneria		54.5		45.5	27.3	27.3	0.0	21.8
STUPEC Sago pondweed		36.4		63.6	36.4	0.0	0.0	7.3
NAJFLE Slender naiad		18.2		81.8	18.2	0.0	0.0	3.6
POTGRA Variable pondweed		18.2		81.8	18.2	0.0	0.0	3.6
POTILL Illinois pondweed		18.2		81.8	18.2	0.0	0.0	3.6
UTRMAC Great bladderwort		9.1		90.9	0.0	9.1	0.0	5.5
POTAMP Largeleaf pondweed		9.1		90.9	9.1	0.0	0.0	1.8
POTZOS Flatstem pondweed		9.1		90.9	9.1	0.0	0.0	1.8

Figure 5 5-10 Foot Contour Plant Community Descriptors for Wall Lake

Occurrence and Abundance of Submersed Aquatic Plants - 10 to 15 ft.								
Lake: Wall			Secchi(ft): 13.4			SE Mean species / site: 0.15		
Date: 7/26/2007			Littoral sites with plants: 9			Mean natives / site: 0.90		
Littoral Depth (ft): 18.0			Number of species: 4			SE Mean natives / site: 0.10		
Littoral Sites: 10			Maximum species / site: 2			Species diversity: 0.64		
Total Sites: 10			Mean species / site: 1.00			Native diversity: 0.57		
		Frequency of	Score Frequency					
Species	Occurrence		0	1	3	5	Dominance	
CHAR Chara	50.0		50.0	40.0	0.0	10.0	18.0	
POTZOS Flatstem pondwee	30.0		70.0	30.0	0.0	0.0	6.0	
POTCRI Curlyleaf	10.0		90.0	10.0	0.0	0.0	2.0	
VALAME Vallisneria	10.0		90.0	10.0	0.0	0.0	2.0	
NAJFLE Slender naiad	0.0		100.0	0.0	0.0	0.0	0.0	

Figure 6 10-15 Foot Contour Plant Community Descriptors for Wall Lake

Occurrence and Abundance of Submersed Aquatic Plants - 15 to 20 ft.								
Lake: Wall			Secchi(ft): 13.4			SE Mean species / site: 0.13		
Date: 7/26/2007			Littoral sites with plants: 2			Mean natives / site: 0.20		
Littoral Depth (ft): 18.0			Number of species: 1			SE Mean natives / site: 0.13		
Littoral Sites: 9			Maximum species / site: 1			Species diversity: 0.00		
Total Sites: 10			Mean species / site: 0.20			Native diversity: 0.00		
		Frequency of	Score Frequency					
Species	Occurrence		0	1	3	5	Dominance	
CHAR Chara	20.0		80.0	20.0	0.0	0.0	4.0	
NAJFLE Slender naiad	0.0		100.0	0.0	0.0	0.0	0.0	

Figure 7 15-20 Foot Contour Plant Community Descriptors for Wall Lake

<b>Descriptor</b>	8/8,15/06 Tier II	7/26/07 Tier II	Change 2006- 2007
Plant % Frequency of Occurrence	68	63	-5
Total number of species	10	10	No change
Number of native species	9	9	No change
Mean Species per Site	1.42	1.10	-.32
Species Diversity	.82	.75	-.07
<b>% Frequency of Occurrence by species</b>			
Chara	50	49	-1
Vallisneria	8	17.6	+9.6
Variable pondweed	12	9.8	-2.2
Sago pondweed	16	9.8	-6.2
Flatstem pondweed	14	3.9	-10.1
Slender naiad	6	5.9	-.1
Illinois pondweed	14	3.9	-10.0
Great Bladderwort	0	2	+2
Largeleaf pondweed	8	2	-6
Curlyleaf pondweed	4	2	-2
Eurasian watermilfoil	6	0	-6

**Table 5 2006 to 2007 Season Species Percent Occurrence Comparison and Change 2006-2007**

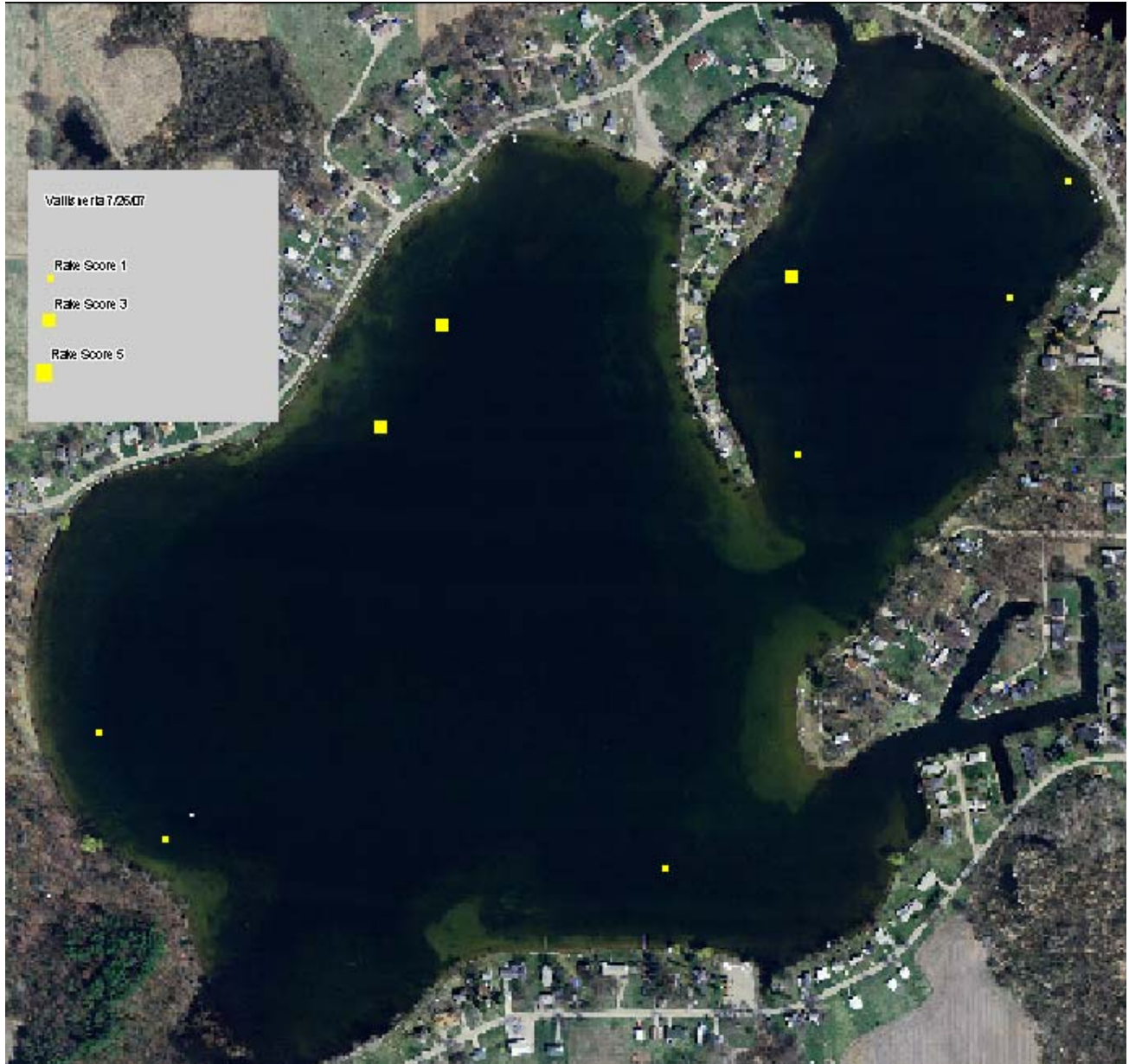


**Table 6 Tier II Sites Where Chara Occurred**



**Table 7 Tier II Sites Where Variable Pondweed Occurred**





**Table 8 Tier II Sites Where Vallisneria Occurred**

## 9.0 Aquatic Vegetation Management Alternatives

For the full list of options for controlling exotic plants see: *Aquatic Plant Management Plan, Wall Lake, Lagrange County, Indiana* (Aquatic Enhancement & Survey, Inc. 2005 and *Wall Lake Aquatic Vegetation Management Plan Update, LaGrange County, Indiana* 2006) The current main management options for Wall Lake are summarized in the table below.

Option	Benefits	Drawbacks
No Control	No dollar cost, No water-use restrictions, No immediate impact to non-target plants	Possible Degraded fish & wildlife value, possible exacerbation of sportfish stunting, Impeded recreational use, aesthetic problems
Biocontrol Weevils	No swimming restrictions, No watering restrictions	Often ineffective, Cost prohibitive
Biocontrol Grass Carp	No water-use restrictions, possible multi-season control	Results not-predictable, illegal in Indiana public waters, may cause water clarity/quality problems, limited selectivity
Harvesting	No water-use restrictions, Removes some nutrients from lake	May hasten spread Eurasian milfoil through fragmentation and hydrosol disturbance, Expensive, May result in regrowth within same season, Requires plant disposal site, Non-selective
Benthic liners	No water-use restrictions, possible multi-seasonal control	Impairs benthic habitat, Not generally permitted in Indiana Public Waters, Not feasible in deep water, Inherent maintenance problems
Aquatic Pesticides (2-4-D)	Highly selective control, Very effective	Intermediate expense, difficult application, Swimming and irrigation restrictions, Generally provides one season's control. Water clarity can suffer after some treatments
Aquatic Pesticides(Renovate)	Highly selective control, Very effective	Expensive- materials expense, Swimming and irrigation restrictions, Generally provides one season's control, Water clarity can suffer after some treatments
Aquatic Pesticides (Sonar a.s.)	Highly selective control, Very effective, Multi-seasonal control	Expensive product, irrigation restrictions, possible damage to non-target vegetation
Aquatic Pesticides (contact herbicides) (diquat dibromide or endothols)	Some selectivity, Very effective, fast acting, least expensive application	Generally provides on season's control, Possible regrowth in late season, Swimming, Irrigation, and possible fish consumption restrictions, some treatments may impact water clarity

**Table 9 Management Alternatives at Wall Lake**

## 10.0 Public Involvement

A public meeting for Wall Lake's plant management was incorporated into the regular association meeting and pot luck dinner on July 14, 2007 at the Wall Lake Fisherman's Association club facility. Approximately 45 people were in attendance. Information was presented by Aquatic Enhancement & Survey, Inc. A discussion was held about the status and goals of the Wall Lake Plant Management Plan and opportunity was provided for lake residents to ask questions and provide input regarding the plant management and water-use restrictions involved. The discovery of Hydrilla *Hydrilla verticillata* at Lake Manitou and its possible implications for Wall Lake were also discussed. The Lake Use Survey below was distributed to those present, filled out, and collected. Twenty-five surveys were returned. Twenty two respondents indicated that they were lake property owners, one indicated they were not. All were association members. When asked how long they had resided at the lake 11 respondents indicated they were 20+ year residents, five were 6-10 year residents, four were 11-20 year residents, and two were 0-5 year. Nineteen indicated that the growth of aquatic plants had detracted from their enjoyment of the lake at some point, three said it had not. When asked to mark ways in which they use the lake 23 respondents marked boating, 23 marked "enjoy the view and atmosphere", 21 marked swimming, 20 marked "view wildlife", 19 marked fishing, 7 indicated they use the lake water for irrigation. When asked to write in other lake activities one respondent indicated "catching turtles" as an activity. When asked whether Wall Lake contained aquatic plants in nuisance quantities at the current time (post treatment) 18 respondents marked "no" two marked "yes". Twenty one respondents indicated that they own or occupy lakeshore property while two did not. None of the respondents were residents of the lake's channels. When asked whether they felt that the level of aquatic vegetation at the lake affects their property value 18 indicated it did, while only two said it did not. Twenty respondents said they were in favor of continued vegetation control while two were not. Respondents were presented a list of seven common lake problems and asked to mark which apply to Wall Lake. Canada geese were the lead problem as indicated by 23 respondents. The second most commonly marked problem was "additional speed enforcement needed". "Too many aquatic plants" was marked by six respondents, five marked "dredging needed", two marked "not enough plants", one marked "poor water clarity" and one indicated "too much fishing" as a problem. Other comments added to the form included one indication that silt is bothersome to swimmers, one complained about speeding on the road adjacent to the lake, one wrote in "keep up the good work", two indicated they were thankful to receive help from the LARE program, one indicated that more natural shoreline was needed. One resident complained that there were not enough fish, and another complained that the weeds that are now gone had been good for the fishing and indicated they had decided not to buy a home there now. Overall the meeting attendants were very interested in continuing efforts to manage exotic plants at the lake and were pleased with plant management results thus far. Some residents were concerned by the lack of pondweeds in the 2007 season. To be inclusive of most lake users it will be important in future seasons to allow the lakes native pondweeds to thrive, while holding exotic plants in check.



### Lake User Survey Wall Lake 7/14/07

1. Are you a lake property owner? Yes \_\_\_\_\_ No \_\_\_\_\_
2. Are you currently a member of your lake association? Yes \_\_\_\_ No \_\_\_\_
3. How many years have you been at the lake? (circle one) 0-5 years  
6-10 years  
11-20 years  
more than 20 years
4. Has the growth of aquatic plants on Wall Lake ever negatively affected your enjoyment of the lake? Yes \_\_\_\_\_ No \_\_\_\_\_
5. How do you use the lake? (mark all that apply)  
\_\_\_\_Swimming      \_\_\_\_Irrigation (including lawn)      \_\_\_\_Enjoy View and Atmosphere  
\_\_\_\_Boating      \_\_\_\_Fishing      \_\_\_\_View Wildlife      \_\_\_\_Skiing/boarding/Tubing  
Other \_\_\_\_\_
6. Do you feel that Wall Lake has Aquatic plants in nuisance quantities at this time(2007)? Yes \_\_\_\_ No \_\_\_\_
7. Do you own or occupy property on a \_\_\_\_\_channel \_\_\_\_\_Lakeshore\_\_\_\_\_Neither
8. Do you feel the level of vegetation in the lake affects your property values? Yes \_\_\_\_ No \_\_\_\_
9. Are you in favor of continuing efforts to control vegetation on the lake? Yes \_\_\_\_  
No \_\_\_\_
10. Mark any of these you think are problems on your lake:  
\_\_\_\_ Too much fishing  
\_\_\_\_ Canada Geese  
\_\_\_\_ Excessive boat traffic  
\_\_\_\_ Dredging needed  
\_\_\_\_ Too many aquatic plants  
\_\_\_\_ Not enough aquatic plants  
\_\_\_\_ Poor water clarity  
\_\_\_\_ Additional Speed enforcement needed  
Other \_\_\_\_\_

**Please add any additional comments on the back:**

☐ Check here if commenting on the back

## **11.0 Public Education**

The Wall Lake Fisherman's Club should set reasonable goals for increasing awareness among lake users about lake health issues. Wall Lake holds monthly general meetings and board meetings June through September of each year with an additional board meeting held in May. These meetings along with the association newsletter can continue to serve as the primary vehicles for disseminating information. An association website might be another way that relevant information can be shared. The following areas should be addressed:

- **Prevention of the spread of Exotic Invasive Aquatic and Wetland Species**

An effort should be made to make lake users aware that boat trailers probably introduced Curlyleaf pondweed and Eurasian watermilfoil to Wall Lake or could spread these plants to other lakes if care is not taken to remove vegetative debris. Basic plant identification should be addressed so new invasive species appearing can be spotted early on by the lake users.

- **Prevention of lake nutrient enrichment.**

An effort should be made to encourage all lake residents still applying phosphorus to their lawns to switch to no-phosphorus lawn fertilizers. Residents should also be made aware that soils lost through erosion in the watershed carry nutrients into the lake's waters as do sediments mobilized from the lake's bottom and shoreline by watercraft. Area residents should be aware of proper erosion control techniques at construction sites within the watershed. Wall Lake residents should continue to remain active in local issues regarding agricultural practices and wastewater treatment and continue to pursue the other recommendations from their Lake Diagnostic Study.

- **Expectations and water use restrictions associated with Plant Management**

Lake users should be made aware that LARE funds are intended to address only Exotic species of aquatic plants and control of plants will not occur throughout the whole lake. It is also important that residents understand and obey the posted water use restrictions associated with any chemical treatments performed.

## **12.0 Integrated Management Action Strategy**

Exotic plant management at Wall Lake should take an approach consisting of three tiers of action working toward this plan's primary goals:

**Tier 1. Nutrient and Sediment control.**

The Wall Lake Fisherman's Club should continue to remain vigilant in spotting and addressing nutrient and sediment sources in the watershed, stopping pollutants at their source before water quality can be impacted.

**Tier 2. Public Education.**

The above educational points can potentially prevent a very costly infestation of new exotic plants and animals at the lake, saving resources that can be utilized to address current problems.

**Tier 3. Exotic Plant Control.**

Addressing the submersed aquatic non-native plants present on a lakewide basis with professional applications of EPA approved aquatic pesticides and monitoring results closely can potentially limit their spread, and preserve the native plant community while providing relief to lake users. The proposed treatment regime involves the performance of an early-season (April) application of Aquathol K herbicide at a concentration of .5 ppm on 10 acres of Curlyleaf pondweed (see fig. 1 section 7 of this report) followed by the application of 2,4-D granular aquatic herbicide to approximately 15 acres of

Eurasian watermilfoil in May (treatment will closely match marked area in fig. 2 section 7). To protect native pondweeds from non-target damage the Aquathol treatment should be cancelled if no Curlyleaf pondweed is present by May 1, 2008. Allowing the native pondweeds in Wall Lake to recover will enhance fish habitat and can promote good water clarity. This will provide appeal to lake users who primarily like to fish. Maintaining control of exotic plants will appeal to lake users who primarily like to cruise or swim in the lake. A treatment for Purple loosestrife around the perimeter of the lake in June is also included as a valuable step in protecting the watershed's wetlands and ultimately protecting water quality. The proposed treatment regime and costs are detailed in the budget and timeline below. A treatment benchmark of a late season Tier II occurrence of five percent or less for both Curlyleaf pondweed and Eurasian watermilfoil, coupled with an increase in the occurrence of the majority of native pondweed species should be sought. If left unchecked in 2008 the growth of Curlyleaf pondweed would likely occupy approximately ten percent of Wall Lake's 102 acre littoral zone and Eurasian watermilfoil would occupy an estimated 15 percent. Except for the addition of Purple loosestrife treatment, this is a relatively close match to the treatment regime proposed in the original five-year plan where treatment of 10 acres of Curlyleaf and 10 acres of Eurasian watermilfoil were planned for 2008. It was estimated that at the time of the 2005 season whole lake treatment approximately 24 acres of Wall Lake had been colonized by Eurasian watermilfoil. It appears at this time that another whole lake treatment may be advisable in the 2009 season, one year earlier than expected in the original five year plan. Ultimately the amount of milfoil growth seen in the 2008 season should be utilized to determine if that schedule is appropriate.

### 13.0 Project Budget & Timeline

<b>2008 Season</b> <b>Treatment Response</b> <b>Benchmark:</b> Late season Tier II occurrence of five percent or less for both Curlyleaf pondweed and Eurasian watermilfoil, coupled with an increase in the occurrence of the majority of native pondweed species.			
<b>Month</b>	<b>Activity</b>	<b>Acreage</b>	<b>Cost Estimate</b>
April	Map Curlyleaf pondweed And Eurasian watermilfoil growth		900.00
April-May 1 if emerged. Not to be treated after May 1	Treat Curlyleaf pondweed as needed (.5 ppm Aquathol K)	10	3300.00
May	Eurasian treatment on main lake as needed	15	6240.00
June	Treat perimeter of Lake for Purple Loosestrife	<1	500.00
July	Tier II Survey		1200.00
As arranged	Public Meeting		350.00
October/November	Permit Meeting		200.00
December	Plan Update Document Due		1500.00
	<b>Total Cost, Pesticide Applications</b>		<b>\$10040.00</b>
	<b>Total Cost, Consultant</b>		<b>\$4150.00</b>
	<b>Total</b>		<b>\$14190.00</b>

<b>2009 Season</b> <b>Treatment Response</b> <b>Benchmark:</b> Late season Tier II occurrence of five percent or less for both Curlyleaf pondweed and Eurasian watermilfoil			
<b>Month</b>	<b>Activity</b>	<b>Acreage</b>	<b>Cost Estimate</b>
April	Map Curlyleaf pondweed And Eurasian watermilfoil growth		900.00
April-May 1 if emerged. Not to be treated after May 1	Treat Curlyleaf pondweed as needed (.5 ppm Aquathol K)	10	3300.00
May	Eurasian treatment (whole lake 6 bump 6)	20	17000.00
June	Treat perimeter of Lake for Purple Loosestrife	<1	500.00
July	Tier II Survey		1200.00
As arranged	Public Meeting		350.00
October/November	Permit Meeting		200.00
December	Plan Update Document Due		1500.00
	<b>Total Cost, Pesticide Applications</b>		<b>\$20800.00</b>
	<b>Total Cost, Consultant</b>		<b>\$4150.00</b>
	<b>Total</b>		<b>\$24,950.00</b>

<b>2010 Season</b> <b>Treatment Response</b> <b>Benchmark:</b> Late season Tier II occurrence of five percent or less for both Curlyleaf pondweed and Eurasian watermilfoil.			
	<b>Month</b>	<b>Activity</b>	<b>Cost Estimate</b>
April	Map Curlyleaf pondweed And Eurasian watermilfoil growth		900.00
April-May 1 if emerged. Not to be treated after May 1	Treat Curlyleaf pondweed as needed (.5 ppm Aquathol K)	10	3300.00
May	Eurasian treatment on main lake as needed	5	2773.00
June	Treat perimeter of Lake for Purple Loosestrife	<1	500.00
July	Tier II Survey		1200.00
As arranged	Public Meeting		350.00
October/November	Permit Meeting		200.00
December	Plan Update Document Due		1500.00
	<b>Total Cost, Pesticide Applications</b>		<b>\$6573.00</b>
	<b>Total Cost, Consultant</b>		<b>\$4150.00</b>
	<b>Total</b>		<b>\$10723.00</b>

<b>2011 Season</b> <b>Treatment Response</b> <b>Benchmark:</b> Late season Tier II occurrence of five percent or less for both Curlyleaf pondweed and Eurasian watermilfoil.			
<b>Month</b>	<b>Activity</b>	<b>Acreage</b>	<b>Cost Estimate</b>
April	Map Curlyleaf pondweed And Eurasian watermilfoil growth		900.00
May	Eurasian treatment on main lake as needed	10	5546.00
June	Treat perimeter of Lake for Purple Loosestrife	<1	500.00
July	Tier II Survey		1200.00
As arranged	Public Meeting		350.00
October/November	Permit Meeting		200.00
December	Plan Update Document Due		1500.00
	<b>Total Cost, Pesticide Applications</b>		<b>\$6046.00</b>
	<b>Total Cost, Consultant</b>		<b>\$4150.00</b>
	<b>Total</b>		<b>\$10196.00</b>

#### 14.0 Monitoring and Plan Update Procedures

The Wall Lake Aquatic Plant Management Program should continue to be monitored and updated on an annual basis. Monitoring will consist of monitoring not only the lake's plant community but the thoughts and opinions of the lake's users. To monitor the lake's plants exotic growth will be remapped each spring and compared with the previous season's growth pattern. A tier II survey in the late season after treatment has been initiated will serve to characterize the lake's overall plant community statistically and also gage if treatment bench marks have been attained. If treatment response bench marks are not attained changes in the treatment timing, control method used, or integrated approach will all be options for setting a new course toward success. To monitor the thoughts and opinions of lake users at least one public meeting should be held annually and a survey distributed. An open forum at the meeting should exist to allow for discussion of water-use restrictions associated with treatments, new problems arising at the lake, or treatment effectiveness. Updates on program progress and developments should be issued in the Wall Lake Fisherman's Club Newsletter.

## **15.0 Literature Cited**

IDNR 2007, Tier II Aquatic Vegetation Survey Protocol, May 2007, Indiana Department of Natural Resources, Division of Fish and Wildlife, 402 W. Washington St. Rm W-273, Indianapolis, IN 46204

Pearson, J. 2004, A sampling method to assess occurrence, abundance and distribution of submersed aquatic plants in Indiana lakes, Indiana Department of Natural Resources, Division of Fish and Wildlife, Tri-Lakes Fisheries Station, 5570 North Hatchery Road  
Columbia City, Indiana 46725

IDNR 1997 Indiana Department of Natural Resources. Exotic Plant Species In Indiana Lakes. Lake and River Enhancement Program, Division of Soil Conservation, Indiana Department of Natural Resources, Indianapolis, IN.

Crowell, Wendy J., N.A. Proulx, and C.H. Welling, 2006. Effects of Repeated Fluridone Treatments Over Nine Years to Control Eurasian watermilfoil in a Mesotrophic Lake.







## **16.0 Appendices**

### **Appendix 16.1 Plant Survey Data Sheets**



## **Appendix 16.2**

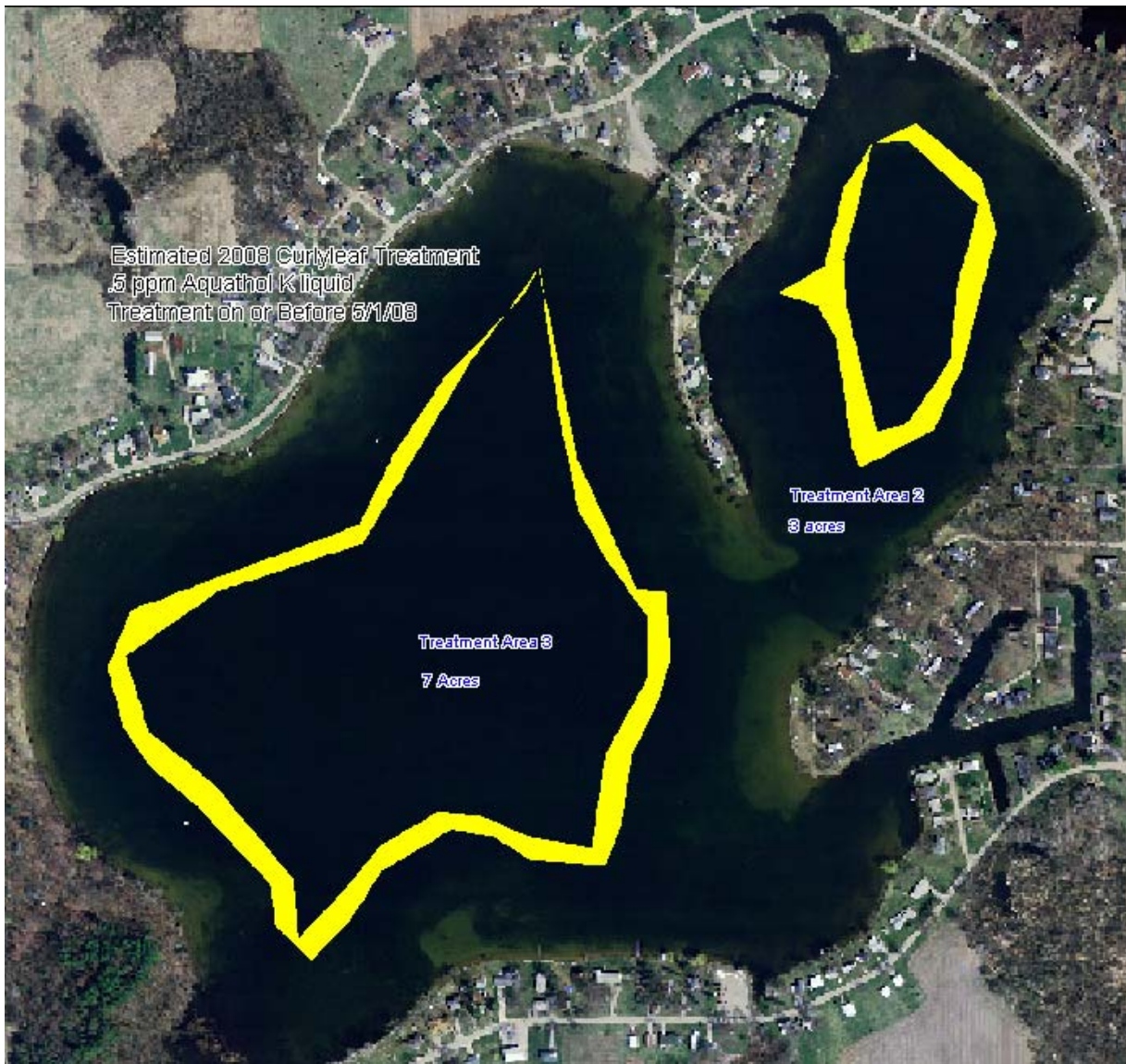
### **Treatment Data and Maps**













## **Appendix 16.3**

### **IDNR Vegetation Permit Application**



## **Appendix 16.4**

### **Pesticide Use Restrictions / Pesticide Labels**



**Appendix 16.5**  
**Resources For Aquatic Vegetation Management**  
**(funding and technical assistance)**





## **Appendix 16.6**

# **State Regulations Relevant to Aquatic Plant Management**